WEST BRANCH OF THE GRAND CALUMET RIVER, INDIANA

TECHNICAL MEMORANDUM

CHARACTERIZATION OF GROUNDWATER AND SOILS ADJACENT TO REACH #4

RESTORATION ALTERNATIVES DEVELOPMENT AND EVALUATION FOR NATURAL RESOURCE RESTORATION

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Technical Memorandum
Characterization of Groundwater and Soils Adjacent to Reach #4 of the West Branch of the Grand Calumet River

This Technical Memorandum (TM) describes nine tasks that upon completion will provide information on potentially contaminated groundwater that will be used by Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) to evaluate and develop contaminated sediment management alternatives for the West Branch of the Grand Calumet River (WBGCR). This work will be completed for the U.S. Fish & Wildlife Service (USFWS) and Indiana Department of Environmental Management (IDEM) in their role as members of the Grand Calumet River Restoration Fund (GCRRF) Council. Other member agencies to the GCRRF Council include the US Environmental Protection Agency (USEPA) and the Indiana Department of Natural Resources (IDNR). This TM has been prepared based on information obtained during the on-site sediment sampling conducted in October 2002 and subsequent review and preliminary interpretation of field data. It represents our preliminary analysis of an approach to address the recently recognized non-aqueous phase liquid (NAPL) in the groundwater that was found to be in contact with sediments along Reach #4 of the WBGCR. The nature and extent of the NAPL is considered a data gap with regard to developing effective and compliant restoration alternatives for managing contaminated sediments in the WBGCR.

The purpose of this TM is to provide an approach or series of approaches to collect hydrogeologic data and information regarding the nature and extent of potential groundwater contamination in Reach #4 of WBGCR that could influence sediment restoration actions, affect planning requirements, and determine design factors. The presence of potentially contaminated groundwater could also potentially recontaminate restored sediments once restoration actions have been completed.

Since we will be dealing with potentially contaminated soil and groundwater and different drilling and boring procedures than the Roxana Marsh and WBGCR sediment investigation projects, new work plans would need to be prepared. These plans could be based partially, as appropriate, upon significant parts of the previous plans such as the QAPP. In addition to adding appropriate sampling procedures, revisions will have to include modifying appropriate health and safety and investigation-derived waste (IDW) management procedures before performing the fieldwork. Following completion of the field activities and analysis of groundwater and soil samples, a site characterization report would be completed. The data collected would be used evaluate the nature and extent of contamination in the subsurface soils and groundwater using basic assessment approaches. More sophisticated assessments such as groundwater flow modeling or significant hydrogeologic interpretations would entail considerably more effort, both in terms of field data collection as well as data management and interpretation, and are not considered at this time. A brief summary of each task is presented below.

Task 1. Work Plans

Prior to going into the field to do the drilling, surveying and sampling, work plans will have to be prepared. The work plans will be developed based on the WBGCR and Roxana Marsh Work

Plans to the greatest extent possible and would address personnel and equipment to be used, methods to be employed, acquisition of monitoring well installation permits (if needed), personnel safety, support for public involvement meetings regarding upcoming field work, and data processing and reporting. It is assumed that draft and final versions of the work plans would be prepared and that plan reviews would be by the current review team of USFWS and IDEM.

Allow up to 6-8 weeks to complete final plans including agency review time and a cost range of [redacted] to accomplish this task depending on the magnitude of the drilling and sampling program. This effort assumes one scouting trip to the area by a geologist to identify prospective drilling locations that have suitable and secure access, safe and compliant work areas, and to determine best locations for IDW management and staging. The estimated level of effort also includes a preliminary review of historical information regarding other known and investigated sites in the area and identifying potential existing monitoring wells in the vicinity. The review would determine the degree, if any, upon which existing data in the area could be used and extrapolated to meet the needs of this project. The overall level of effort will also vary depending on the degree to which prior project work plans, QAPPs, HASPs and investigation-derived waste (IDW) management plans can be adapted to use as base documents, and any level of support needed to assist with community relations.

Task 2. Access Agreements

It is assumed that wells would need to be placed on land controlled by several different landowners or rights of way controlled by various agencies. It is anticipated that several of the landowners controlling the optimum locations for monitoring wells could be different from those approached in the past for direct access to the river channel and Roxana marsh. USFWS & IDEM would be responsible for acquiring the necessary new access permissions and scheduling arrangements. Foster Wheeler would provide assistance in determining locations and access requirements for drilling, where access would be needed, and reviewing the draft and final access agreements that the client would obtain. Foster Wheeler's time is for consultation and advisement during the access agreement phase.

Assistance with access agreements is estimated to be [redacted] during the planning period depending on the number of agreements needed and the number of wells to be installed.

Task 3. Well Installation and Sampling

Monitoring well installation and sampling are required to evaluate the areal extent and migration potential of groundwater contamination along Reach 4 of the WBGCR. Borings will be advanced using standard hollow-stem auger drilling techniques or equivalent sampling equipment to an estimated average depth of 20-25-ft with a maximum estimated depth of 30 feet. Monitoring wells would be completed in the boreholes, but because of the possible presence of contaminant sources and NAPLs there is a concern over potential cross contamination. Consequently, certain well locations may require multiple well screen completions with conductor casings or telescoped well casings. Also, because this area is urbanized with a long history of infrastructure development, drilling over any extended area could encounter subsurface obstacles or materials, which result in refusal and may require relocation and redrilling of some boreholes. We have

taken these logistical issues into our assumptions about the possible productivity of drilling and field activities.

Continuous soil cores would be recovered and logged with a subset sampled and analyzed to characterize the soil for potential sources of contamination. Based on a visual inspection of each core, approximately two-three soil intervals from each core will be submitted for chemical analysis. Sample intervals selected for analysis will consider features noted in the boreholes or readings from onsite monitoring devices. Intervals not submitted for analysis will be archived for possible future analysis or geotechnical testing.

Since the source and extent of this contamination is currently unknown, the WBGCR sediment contamination data has not yet been fully plotted and interpreted, and the presence of existing wells has not been determined; the scale and total number of any well installation program is difficult to estimate. A phased approach to well installation and sampling is therefore the most prudent approach to follow until sufficient information is available to accurately prepare a scope of work. During field discussions when the WBGCR field team first recognized these conditions, a rough number of wells was initially set at 30-wells. While that number may ultimately be needed to fully define contamination limits and establish hydrogeologic conditions sufficient to complete full characterization of the area surrounding this reach of the river, an initial phase of ten wells may be sufficient to delineate preliminary nature and extent and establish source and migration trends.

Table 1 presents estimated cost ranges for completing the field drilling, installation and sampling activities using both conservative and favorable assumptions and various approaches.

Table 1. Estimated costs for well installation and sampling for Reach 4 of the WBGCR

Activity	Low Cost Range	High Cost Range	Comments
Drilling & soil sampling, well installation and development, and one round of groundwater sampling[1]	[redacted]	[redacted]	10 wells – single mobilization
	[redacted]	[redacted]	20 wells – single mobilization
	[redacted]	[redacted]	30 wells – single mobilization

1/ *Number of soil samples proposed for analysis is two-three (2-3) samples per borehole, selected at discretion of field geologist. Additional samples may be required for analysis based on field observations and results of these initial analyses. Analytical data would be used to identify and characterize potential sources. Results would also be used to characterize IDW to meet management and disposal requirements.*

This task will be completed with a local drilling company with two Foster Wheeler Environmental field personnel working 10-hour days, including mobilization and demobilization

to and from the site. Soil and water samples will be delivered to Severn-Trent Labs located in the Chicago-area, Illinois for chemical analysis (Task 5). Archive soil samples will be stored for possible future analysis at a designated storage facility or the laboratory.

To complete a ten (10) well installation and sample collection project, allow [redacted] to accomplish field activities under this task. To complete a twenty (20) well installation and sample collection project, allow [redacted] to accomplish field activities under this task. To complete a thirty (30) well installation and sample collection project, allow [redacted] to accomplish field activities under this task.

For this ROM, average drilling cost and productivity rates and assumptions were extrapolated from similar projects with similar conditions. For the different numbers of wells, a low cost range was determined using favorable assumptions of drilling prices and conditions and a higher cost range used more conservative assumptions regarding higher costs, more difficult conditions, and lower field productivity. Once USFWS and GCRRF have determined a more definitized scope of work, then a more detailed cost estimate can be prepared using quotes from potential drilling subcontractors.

Task 4. Horizontal and Vertical Control

Foster Wheeler Environmental staff, with the assistance of a local licensed surveyor; will survey each well to determine northing, easting and elevation of each well casing to be provided in NAD 83 for X and Y and NGVD29 and/or NAVD 88 at a 0.1-foot accuracy for X,Y and within a couple hundredths of a foot for Z. The survey to establish well x, y, and z will be performed during the first few days of well development while the field crew was still on site so that no separate mobilization would be required.

Allow up to 2-3 weeks to accomplish this task, with the preparation of the maps and drawings taking most of the time. To complete the surveys using a qualified subcontractor, allow a cost of [redacted] depending upon the number of wells and the ease of site access for each.

Task 5. Chemical Analysis

Selected soil samples and groundwater samples will be analyzed for metals, TPH (gasoline and diesel ranges), semivolatile organics (SVOCs), volatile organics (VOCs), chlorinated pesticides, and PCBs (Aroclors). Additional parameters and lab or data procedures are factored into the assumed scope. Labor costs include managing laboratory subcontractors, tracking sample and analytical performance, and addressing technical issues during the analysis process.

Contaminants of concern and physical properties for analysis:

Analytical Parameter

- PCBs
- Pesticides
- GPC cleanup
- SVOCs
- RCRA metals plus Copper, Nickel, and Zinc

- TPH-Gasoline
- TPH-Diesel
- VOCs
- Grain size
- Electronic data deliverable (EDD)

Activity	Soil (2/boring) & Groundwater Analysis Cost	Soil (3/boring) & Groundwater Analysis Cost	Comments
Soil samples (2-3) and one round of groundwater sampling[2]	[redacted]	[redacted]	10 wells
	[redacted]	[redacted]	20 wells
	[redacted]	[redacted]	30 wells

2/ *Number of soil samples proposed for analysis is two-three (2-3) samples per borehole, selected at discretion of field geologist. Additional samples may be required for analysis based on field observations and results of these initial analyses. Analytical data would be used to identify and characterize potential sources and the results would be used for characterization of IDW for management and disposal requirements.*

To complete chemical analysis of the two to three soil samples per boring and one round of groundwater, allow [redacted] to complete this task for ten wells – the low range is for one soil analysis per boring and the high is for two soil sample analyses per boring. To complete chemical analysis of the one to two soil samples per boring and one round of groundwater, allow [redacted] to complete this task for twenty wells – the low range is for one soil analysis per boring and the high is for two soil sample analyses per boring. To complete chemical analysis of the one to two soil samples per boring and one round of groundwater, allow [redacted] to complete this task for thirty wells – the low range is for one soil analysis per boring and the high is for two soil sample analyses per boring.

Task 6. Investigation Derived Waste Management

Experience on previous, similar field investigations has shown that IDW can be minimized with best-management practices. However, it is expected that the sampling procedures would encounter contaminated materials that are expected generate IDW that would require containerization, waste characterization, and off-site disposal. The IDW expected to be generated in this field program may include soil cuttings from drilling, decontamination fluids, well development and groundwater purge waters, and used personal protection equipment (PPE) (e.g., Tyvek suits, gloves). All excess soil cuttings would have to be containerized after collection as drilling locations are expected to be scattered through the populated area away from the river channel and may be near publicly used areas, so on-site disposal is considered to be inappropriate. Therefore, there is a need to conduct more comprehensive IDW management activities than have been done during sediment sampling projects, which generate much smaller quantities of sampling-related wastes. Soil cuttings, decontamination fluids and purge and development waters will be have to stored in properly labeled 55-gallon drums or other

appropriate containers after collection in a secure location until analytical results are available for characterization for proper disposal. It is assumed that costs will include coordination with an approved disposal transportation and disposal subcontractor and oversight of waste pickup and loading.

To complete this task for ten wells, allow up to [redacted] for coordination, IDW characterization, and disposal fees – the lower cost range applies if wastes are determined to be non-hazardous and the higher cost ranges if disposal at an approved hazardous waste facility is required. To complete this task for twenty wells, allow up to [redacted] for coordination, IDW characterization, and disposal fees – the lower cost range applies if wastes are determined to be non-hazardous and the higher cost ranges if disposal at an approved hazardous waste facility is required. To complete this task for thirty wells, allow up to [redacted] for coordination, IDW characterization, and disposal fees – the lower cost range applies if wastes are determined to be non-hazardous and the higher cost ranges if disposal at an approved hazardous waste facility is required.

Task 7. Data Validation

A complete Contract Laboratory Program (CLP) – type data package will be produced by the chemistry laboratories for all data. An independent subcontractor will complete a Level 4 full data validation on all chemistry data.

To complete the data validation, allow [redacted] to complete this task for ten wells, [redacted] to complete this task for twenty wells, and [redacted] to complete this task for thirty wells.

Task 8. Site Characterization Report

Once sampling and testing have been completed, all chemistry and physical data will be entered into the Grand Calumet River database for further evaluation. A report will be completed that presents the nature and extent of contamination, including an assessment of potential sources and migration of contaminants in groundwater adjacent to this portion of the river.

The cost to complete the site characterization report is [redacted] depending on the number of wells installed and sampled with lower cost for ten wells and the higher range for thirty wells.

An alternate approach to data reporting could be to compile a data deliverable with only a brief summary of field and analytical activities, then roll plotting, assessment, and interpretation of the data into Phase III of the project. This approach with a minimalist data deliverable report would reduce the reporting task by about 40-50% of the current estimate ranges.

Task 9. Project Management

Project management is estimated at 8-10% the total hours under the period of performance to complete this work. This will include time for communications with the client contact including

monthly status reports; weekly progress updates with field staff, subcontractors, and administrative staff, and other project management functions such as subcontractor procurement, management, and closeout, contract-required reporting, financial tracking, and contract closeouts. We assumed a nine-month period of performance to complete all tasks.

Project management costs are estimated to range from [redacted] during the period of performance depending on the size and duration of the project.

Cost summaries for three scenarios [ten wells, twenty wells, and thirty wells with low and high cost ranges for each scenario] are provided below.

Cost Summary Table – WBGCR Groundwater Estimated Costs – ten wells

	Rough Order of Magnitude Estimate Range			
Task	**Title**	**Subtask Titles**	**Low Range Cost**	**High Range Cost**
1	Work Plans	Draft & Final Plans	[redacted]	[redacted]
2	Access Agreements	Assist in review and acquiring agreements	[redacted]	[redacted]
3	Sample Collection	Mobilization, drilling & soil sampling, development, sampling, demobilization	[redacted]	[redacted]
4	Well Surveying	Horizontal and vertical control	[redacted]	[redacted]
5	Soil and Groundwater Chemistry	Chemical Analysis of soil and groundwater	[redacted]	[redacted]
6	IDW Management	IDW Management	[redacted]	[redacted]
7	Data Validation	Data Validation	[redacted]	[redacted]
8	Characterization Report	Draft & Final Reports	[redacted]	[redacted]
9	Project Management	Project Management	[redacted]	[redacted]
	ESTIMATED TOTAL		[redacted]	[redacted]

Cost Summary Table – WBGCR Groundwater Estimated Costs – twenty wells

	Rough Order of Magnitude Estimate Range			
Task	**Title**	**Subtask Titles**	**Low Range Cost**	**High Range Cost**
1	Work Plans	Draft & Final Plans	[redacted]	[redacted]
2	Access Agreements	Assist in review and acquiring agreements	[redacted]	[redacted]
3	Sample Collection	Mobilization, drilling & soil sampling, development, sampling, demobilization	[redacted]	[redacted]
4	Well Surveying	Horizontal and vertical control	[redacted]	[redacted]
5	Soil and Groundwater Chemistry	Chemical Analysis of soil and groundwater	[redacted]	[redacted]
6	IDW Management	IDW Management	[redacted]	[redacted]
7	Data Validation	Data Validation	[redacted]	[redacted]
8	Characterization Report	Draft & Final Reports	[redacted]	[redacted]
9	Project Management	Project Management	[redacted]	[redacted]
	ESTIMATED TOTAL		[redacted]	[redacted]

Cost Summary Table – WBGCR Groundwater Estimated Costs – thirty wells

	Rough Order of Magnitude Estimate Range			
Task	**Title**	**Subtask Titles**	**Low Range Cost**	**High Range Cost**
1	Work Plans	Draft & Final Plans	[redacted]	[redacted]
2	Access Agreements	Assist in review and acquiring agreements	[redacted]	[redacted]
3	Sample Collection	Mobilization, drilling & soil sampling, development, sampling, demobilization	[redacted]	[redacted]
4	Well Surveying	Horizontal and vertical control	[redacted]	[redacted]
5	Soil and Groundwater Chemistry	Chemical Analysis of soil and groundwater	[redacted]	[redacted]
6	IDW Management	IDW Management	[redacted]	[redacted]
7	Data Validation	Data Validation	[redacted]	[redacted]
8	Characterization Report	Draft & Final Reports	[redacted]	[redacted]
9	Project Management	Project Management	[redacted]	[redacted]
	ESTIMATED TOTAL		[redacted]	[redacted]